

**Claims:**

1. A process for the production of methanol comprising:
  - (a) feeding an amount of a hydrocarbon feedstock and an amount of an oxygen feedstock to a partial oxidation reactor to produce a partial oxidation reactor effluent comprising hydrogen, carbon monoxide and carbon dioxide;
  - (b) adding an amount of a hydrogen feedstock to the partial oxidation reactor effluent to produce a synthesis gas stream having a predetermined ratio of hydrogen to carbon monoxide; and,
  - (c) subjecting the synthesis gas stream to methanol synthesis to produce a methanol product stream and a tail gas streamwherein reformation is not used to provide hydrogen as a product.
2. The process as claimed in claim 1 further comprising electrolyzing water to produce hydrogen and oxygen and recovering at least some of the hydrogen to produce at least a portion of the hydrogen feedstock.
3. The process as claimed in claim 2 further comprising the step of recovering at least a portion of the oxygen from the water electrolysis to produce at least a portion of the oxygen feedstock.
4. The process as claimed in claim 1 further comprising the step of adjusting the amount of the oxygen feedstock to the amount of the hydrocarbon feedstock fed to the partial oxidation reactor such that the partial oxidation reactor effluent contains some unoxidized hydrocarbon feedstock.
5. The process as claimed in claim 4 wherein the partial oxidation reactor effluent contains less than about 10 wt % unoxidized hydrocarbon feedstock based on the weight of the partial oxidation reactor effluent.

6. The process as claimed in claim 4 wherein the synthesis gas contains less than about 4 wt % unoxidized hydrocarbon feedstock based on the weight of the partial oxidation reactor effluent.
7. The process as claimed in claim 1 further comprising the step of adjusting the amount of the oxygen feedstock to the amount of the hydrocarbon feedstock fed to the partial oxidation reactor such that the partial oxidation reactor effluent is essentially free of oxygen.
8. The process as claimed in claim 1 wherein the synthesis gas which is subjected to methanol synthesis has a ratio of hydrogen minus carbon dioxide mole fraction to carbon dioxide plus carbon monoxide mole fraction of from about 1:1 to about 3:1.
9. The process as claimed in claim 1 wherein the synthesis gas, which is subjected to methanol synthesis, has a ratio of hydrogen minus carbon dioxide mole fraction to carbon dioxide plus carbon monoxide mole fraction which is about 2:1.
10. The process as claimed in claim 1 further comprising the step of recycling a portion of the tail gas stream to the partial oxidation reactor.
11. The process as claimed in claim 1 further comprising the step of withdrawing a purge stream from the tail gas stream and recycling essentially the remainder of the tail gas stream to the partial oxidation reactor.
12. The process as claimed in claim 1 wherein the tail gas stream contains nitrogen and the method further comprises separating at least a portion of the nitrogen from the waste gas stream to produce a nitrogen rich purge stream and a nitrogen reduced waste gas stream that is recycled to the partial oxidation reactor.

13. The process as claimed in claim 12 wherein a membrane separator is used to separate the tail gas stream into the nitrogen reduced waste gas stream and the nitrogen rich purge stream.
14. The process as claimed in claim 12 further comprising combusting the nitrogen rich purge stream to produce energy.
15. The process as claimed in claim 14 wherein the combustion of the purge stream produces heat that is used to preheat at least one of the feedstocks of the partial oxidation reactor.
16. The process as claimed in claim 14 further comprising electrolyzing water to produce hydrogen and oxygen and recovering at least some of the hydrogen to produce at least a portion of the hydrogen feedstock and wherein the combustion of the purge stream produces electricity.
17. The process as claimed in claim 12 wherein the partial oxidation reactor produces waste heat and the waste heat is used to generate electricity.
18. The process as claimed in claim 2 wherein the electrolysis is conducted by running a fuel cell in reverse.
19. The process as claimed in claim 1 wherein at least a portion of at least one of the hydrocarbon feedstock and the hydrogen feedstock is obtained from biogas.
20. The process as claimed in claim 1 wherein the hydrocarbon feedstock includes carbon dioxide.

21. The process as claimed in claim 20 wherein additional carbon dioxide is provided by a carbon dioxide feed stream and at least a portion of the carbon dioxide stream is obtained from biogas.
22. The process as claimed in claim 20 wherein additional carbon dioxide is provided by a carbon dioxide feed stream.
23. The process as claimed in claim 1 wherein the hydrocarbon feedstock is obtained from biogas and includes carbon dioxide.
24. The process as claimed in claim 23 wherein the carbon dioxide feed stream is provided upstream from the partial oxidation reactor.
25. The process as claimed in claim 23 wherein the carbon dioxide feed stream is provided downstream from the partial oxidation reactor.
26. The process as claimed in claim 1 wherein the biogas is obtained from anaerobic decomposition of biomatter.
27. A process for the production of methanol comprising:
  - (a) feeding a hydrocarbon feedstock to a partial oxidation reactor to produce a synthesis gas comprising hydrogen, carbon monoxide and carbon dioxide;
  - (b) subjecting the synthesis gas to methanol synthesis to produce a methanol product stream and a tail gas stream;
  - (c) separating the tail gas stream into at least two streams comprising a purge stream and a recycle stream, the recycle stream comprising a substantial portion of the tail gas stream; and,
  - (d) recycling the recycle stream to the partial oxidation reactor.
28. The process as claimed in claim 27 wherein the tail gas stream contains nitrogen and step (c) comprises subjecting the tail gas stream to

a separation process such that the recycle stream is nitrogen reduced and the purge stream is nitrogen rich.

29. The process as claimed in claim 27 wherein at least a portion of at least one of the hydrocarbon feedstock, the hydrogen in the synthesis gas and the carbon dioxide in the synthesis gas is obtained from biogas.
30. The process as claimed in claim 27 wherein the hydrocarbon feedstock includes carbon dioxide.
31. The process as claimed in claim 30 wherein additional carbon dioxide is provided by a carbon dioxide feed stream and at least a portion of the carbon dioxide stream is obtained from biogas.
32. The process as claimed in claim 30 wherein additional carbon dioxide is provided by a carbon dioxide feed stream.
33. The process as claimed in claim 27 wherein the hydrocarbon feedstock is obtained from biogas and includes carbon dioxide.
34. The process as claimed in claim 33 wherein the carbon dioxide feed stream is provided upstream from the partial oxidation reactor.
35. The process as claimed in claim 33 wherein the carbon dioxide feed stream is provided downstream from the partial oxidation reactor.
36. The process as claimed in claim 27 wherein the biogas is obtained from anaerobic decomposition of biomatter.
37. A process for the production of methanol comprising:
  - (a) feeding an amount of a hydrocarbon feedstock and an amount of an oxygen feedstock to a partial oxidation reactor to produce a partial

- oxidation reactor effluent comprising hydrogen, carbon monoxide and carbon dioxide;
- (b) electrolyzing water to produce hydrogen and oxygen and recovering at least a portion of the hydrogen to produce a hydrogen stream;
  - (c) reacting carbon dioxide with hydrogen to produce carbon monoxide; and,
  - (d) subjecting a methanol synthesis gas obtained from the partial oxidation reactor effluent, at least a portion of the hydrogen stream and carbon monoxide produced by step (c) to methanol synthesis to produce a methanol product stream and a tail gas stream.
38. The process as claimed in claim 37 further comprising separating the tail gas stream into at least two streams comprising a purge stream and a recycle stream, the recycle stream comprising a substantial portion of the tail gas stream; and recycling the recycle stream to the partial oxidation reactor.
39. The process as claimed in claim 37 wherein the partial oxidation reactor effluent is fed to a reformer to produce a reformed synthesis gas and at least a portion of the hydrogen stream is combined with the reformed synthesis gas to produce the methanol synthesis gas.
40. The process as claimed in claim 37 further comprising combining a carbon dioxide feedstock with the partial oxidation reactor effluent to produce a carbon dioxide rich synthesis gas stream and feeding the carbon dioxide rich synthesis gas stream to the reformer to produce a reformed synthesis gas.
41. The process as claimed in claim 40 wherein at least a portion of the hydrogen stream is combined with the reformed synthesis gas to produce the methanol synthesis gas.

42. The process as claimed in claim 40 wherein at least a portion of the hydrogen stream is introduced to the reformer or a feedstream to the reformer.
43. The process as claimed in claim 37 wherein at least a portion of electricity used to electrolyze the water is valley power.
44. The process as claimed in claim 37 wherein at least a portion of at least one of the hydrocarbon feedstock and the hydrogen feedstock is obtained from biogas.
45. The process as claimed in claim 37 wherein additional carbon dioxide is provided by a carbon dioxide stream and at least a portion of the carbon dioxide stream is obtained from biogas.
46. The process as claimed in claim 37 wherein the hydrocarbon feedstock includes carbon dioxide.
47. The process as claimed in claim 46 wherein additional carbon dioxide is provided by a carbon dioxide feed stream and at least a portion of the carbon dioxide stream is obtained from biogas.
48. The process as claimed in claim 46 wherein additional carbon dioxide is provided by a carbon dioxide feed stream.
49. The process as claimed in claim 37 wherein the hydrocarbon feedstock is obtained from biogas and includes carbon dioxide.
50. The process as claimed in claim 49 wherein the carbon dioxide feed stream is provided upstream from the partial oxidation reactor.

51. The process as claimed in claim 49 wherein the carbon dioxide feed stream is provided downstream from the partial oxidation reactor.

52. The process as claimed in claim 37 wherein the biogas is obtained from anaerobic decomposition of biomatter.